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- ❖ Saving Energy
 - Simple things you can do
 - Building a draft-o-meter
- ❖ Light bulb: *compare and contrast*
- ❖ Analyzing an electric bill
- ❖ Conserving energy at school
- ❖ Developing a personal action plan

Energy Conservation

Energy Conservation

5.1.1 Saving Energy – Be an Energy Saver

“Think-Pair-Share” with a partner the definition of conservation. Share this definition with the class and brainstorm a list of 5 to 10 things students can do to conserve energy.

Activity A: “Simple Things You Can Do to Save Energy”



Materials:

Poster Board (18" x 24")

Scissors

Glue

Markers

Household Energy Icons

Energy Audit Checklist

Procedures:

1. Visit any of the following websites and research ways to conserve energy and reduce energy costs in your home.

Potomac Edison Power Company - www.pepco.com

Baltimore Gas & Electric Company - www.bge.com

US Dept of Energy -

www.eia.doe.gov/emeu/efficiency/energy_savings.htm

2. Make a list of ways to conserve energy. You may want to organize your list into the five rooms you will investigate: kitchen, bathroom, living room, bedroom and basement.
3. Divide into small groups. Each group will need poster paper, scissors, glue, markers, Household Energy Icons and Energy Audit Checklist.
4. Working in groups, construct an Energy Saver Poster. Sketch your house in the middle of the poster board or use the diagram provided by your teacher. Extend arrows to areas where you paste the cut out pictures of household items. Write an energy saving statement next to each item.
5. Share your energy saver poster with the class.

Energy Audit Checklist

The Kitchen

- ❑ **Is the refrigerator seal tight?**
Adjust the door. Clean the dried food off the rubber gasket.
- ❑ **Is the refrigerator in the right location?**
Ask your parents to move the fridge out of the sun and away from the stove.
- ❑ **Have the condenser coils behind or underneath the refrigerator been cleaned lately?**
Unplug the fridge and vacuum off the coils at least twice a year.
- ❑ **Are there any empty spaces in the freezer?**
Fill empty space in the freezer with gallon jugs filled with water.
- ❑ **Is the temperature of the refrigerator between 3° and 6° Celsius (38 - 42 ° Fahrenheit)? And is the temperature of the freezer between - 18 ° and - 15 ° Celsius (0 ° - 5 ° Fahrenheit)?**
Use a simple household thermometer to adjust the temperature.
- ❑ **Is the refrigerator an “energy-efficient” refrigerator?**
- ❑ **Does the kitchen sink have a faucet aerator? Do you use the pause button?** Install one and use it.

The Bathroom

- ❑ **Does your shower have an energy-efficient showerhead?**
Replace your standard showerhead with an energy-efficient showerhead that uses only about 10 liters (2.5 gallons) per minute.
- ❑ **Does your sink have an energy-efficient faucet head?**
Replace your standard faucet head with a faucet aerator.
- ❑ **Is the water off when you are not using it?**
Turn off the water when you don't need it.
- ❑ **Do you use energy-efficient bulbs?**
Replace the incandescent bulbs you use most with energy-efficient compact fluorescent bulbs.
- ❑ **Are all the lights off when you are not in a room?**
Turn off lights when you are not using them.
- ❑ **Are bathroom windows airtight?**
Seal up leaks with weather-stripping, caulk or even fabric “snakes” to keep out those nasty drafts.

The Living Room

- ❑ **Are your windows and doors airtight?**
Seal up leaks with weather-stripping, caulk or even fabric snakes to keep out those nasty drafts.
- ❑ **Is your fireplace air tight?**
Ask your parents to seal up your fireplace.
- ❑ **Do you use energy-efficient bulbs?**
Replace the incandescent bulbs you use most with energy-efficient compact fluorescent bulbs.
- ❑ **Are lights, stereo and TV off when no one is in the room?**
Turn off these and other electronics when you are not using them.

The Bedroom

- ❑ **Do you use energy-efficient bulbs?**
Replace the incandescent bulbs you use most with energy-efficient compact fluorescent bulbs.
- ❑ **Are your windows airtight?**
Seal up leaks with weather-stripping, caulk or even fabric snakes to keep out those nasty drafts.
- ❑ **Are lights, stereo and TV off when no one is in the room?**
Turn off these and other electronics when you are not using them.

The Basement

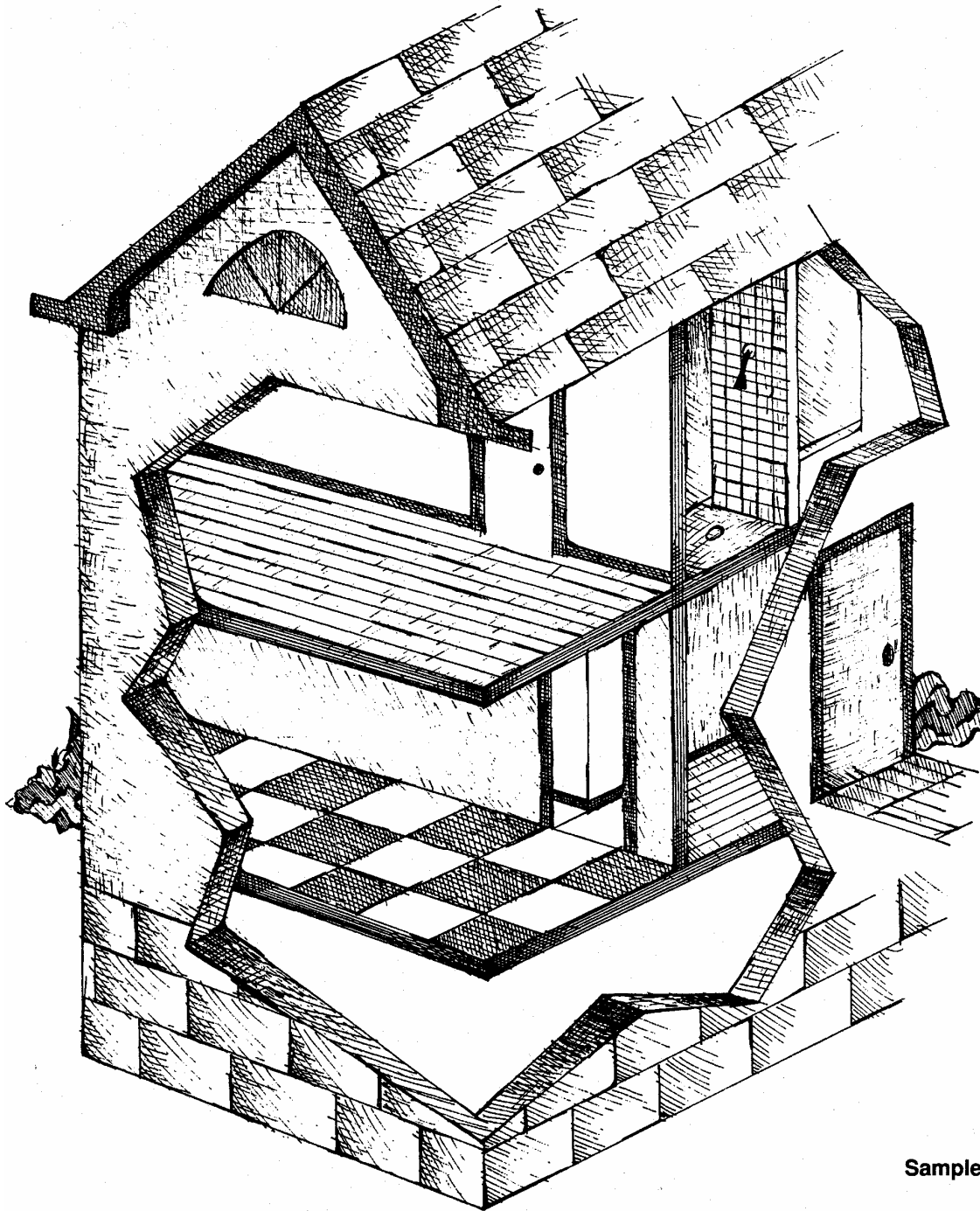
- ❑ **Are your foundation windows and doors airtight?**
Seal up leaks with weather-stripping, caulk or even fabric snakes to keep out those nasty drafts.
- ❑ **Are your hot water pipes insulated?**
Cover your hot water pipes with insulation so they won't lose precious heat.
- ❑ **Is your electric hot water heater insulated?**
Cover your electric hot water heater with a water-heating wrap (insulated blanket).
- ❑ **Has your heating and cooling equipment been serviced regularly?**

Find out from your parents and remind them to adjust the hot water heater temperature to 49°Celsius (120°Fahrenheit).

Student Page

Be An Energy Saver

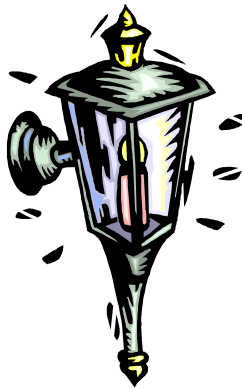
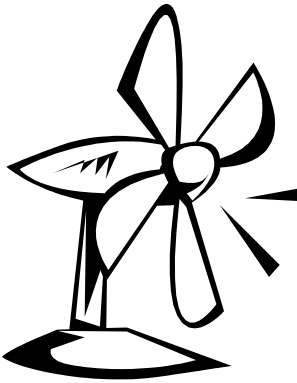
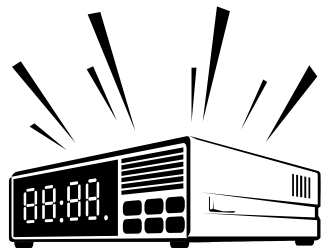
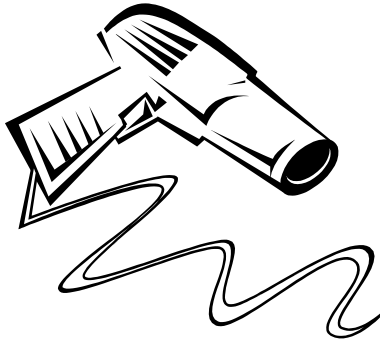
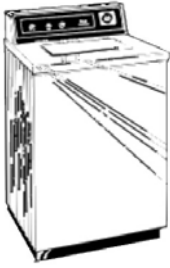
Sample House Clip Art



Sample House

Be An Energy Saver

Household Items Clip Art



Energy Conservation

5.1.2 Saving Energy – Draft-o-meter

Overview

You will be an Energy Saver Investigator analyzing energy waste by detecting drafts. This could be done for your home or school classroom.

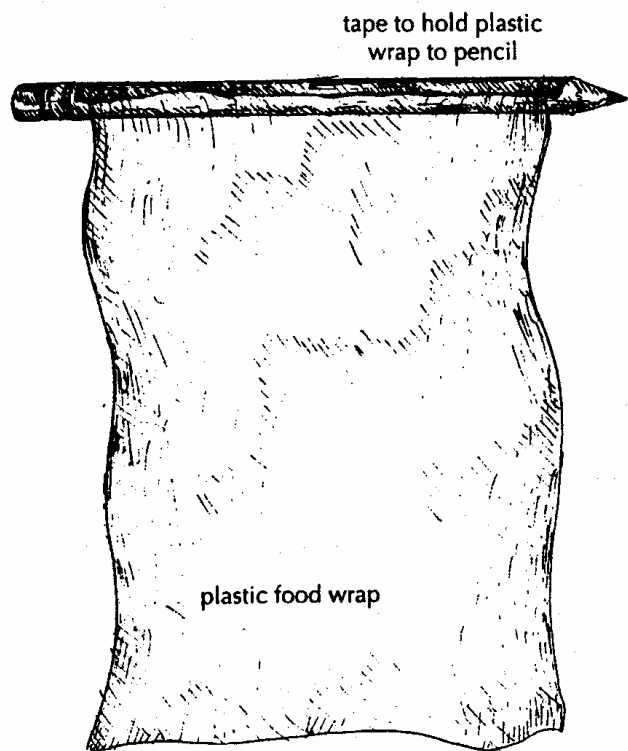
Materials:

Pencil
Tape

Plastic Food Wrap
Home Draft Checklist

Procedures:

1. Construct your draft-o-meter:
 - a. Cut a 12 cm by 25 cm strip of plastic food wrap.
 - b. Tape the shorter edge of the wrap to a pencil and let the rest hang freely.
2. Blow the plastic wrap gently and note how sensitive the wrap is to air movement. Drafts mean that air is leaking into or out of the building. This means either a loss of heat in winter or a loss of air condition in the summer.
3. Check for possible drafts in the classroom and report and discuss your findings.
4. Use the “Home Draft Checklist” to check for drafts in your home. As you survey for drafts, fill out the data chart. Discuss the results with your class.



Saving Energy – Draft-O-Meter

Classroom Draft Check List

Check each of the locations where drafts are likely. Where your draft-o-meter detects drafts, rate them by checking the right column. Rate drafts as 1 (strong), 2 (moderate) or 3 (weak). If there is no draft, check the “no draft” column. If your classroom has other locations where you tested drafts, write them next to other.

Draft Locations	No Draft	Draft Ratings		
		1	2	3
Windows				
Interior Doors				
Exterior Doors				
Other:				
Other:				
Other:				

Discussion:

1. Discuss the results of your classroom survey with your classmates. Summarize the results in a few sentences.
2. What are some places where drafts are likely within your school building?
3. What can be done to prevent drafts?

Saving Energy – Draft-O-Meter

Home Draft Check List

Check each of the locations where drafts are likely. Where your draft-o-meter detects drafts, rate them by checking the right column. Rate drafts as 1 (strong), 2 (moderate) or 3 (weak). If there is no draft, check the “no draft” column. If your classroom has other locations where you tested drafts, write them next to other.

Draft Locations	No Draft	Draft Ratings		
		1	2	3
Windows				
Doors				
Exhaust fans in bathrooms & kitchens				
Dampers in fireplaces and woodstoves				
Light fixtures attached to walls and ceilings				
Window air-conditioning units left in place in winter				
Mail chutes or slots in doors or walls				
Cracks in foundation of the house or holes where pipes pass through				
Attic Door				
Other:				

Discussion:

1. Discuss the results of your home survey with your classmates. Summarize the results in a few sentences.
2. What are some places where drafts are likely?
3. What can be done to prevent drafts?
4. Why are drafts an important energy consideration?

Adapted from The Energy Sourcebook, Tennessee Valley Authority

Energy Conservation

5.2 Light Bulb Compare and Contrast

Overview

Being an energy saver makes a difference because all the little ways you conserve energy add up to make a major impact. In this activity you will investigate the use of light bulbs and how modern technology is trying to make energy saving devices.

Materials

Light Bulb Fact Sheet
Home Light Bulb Survey
Light Bulb Compare & Contrast Graphic Organizer



Procedures

1. Read the Light Bulb Fact Sheet to find out information about a new compact fluorescent light bulb. Use the graphic organizer to gather facts comparing a compact fluorescent bulb to a regular incandescent bulb.
2. Do a home survey investigating light usage in your home. Think-pair-share with a partner to develop a home light bulb survey sheet. Think about the number of bulbs, kinds of bulbs, bulbs on timers and 3-way bulbs.
3. Share and discuss the information you gathered on comparing the characteristics of two kinds of light bulbs with your classmates.
4. Share and discuss the results of the home light bulb survey with your class.
5. Use the graphic organizer to help you prepare a speech to try to persuade your parent/guardian to use certain types of light bulbs for saving energy.
6. Now write your speech and give it to your parents/guardians.

Optional

Give a report to the class regarding the reactions of student's parents/guardians to the speech and relate dialogue that occurred.

Light Bulb Compare & Contrast

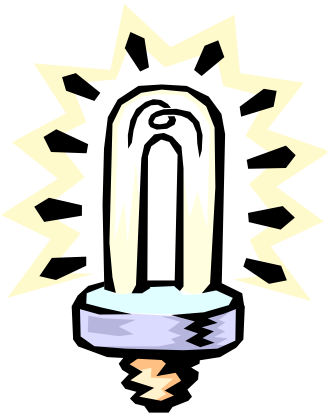
Light Bulb Fact Sheet

How does a fluorescent lamp work? A fluorescent lamp is a glass tube coated on the inside with a phosphorescent substance and filled with argon gas and a small amount of mercury vapor. When electricity is passed through the gas, the mercury emits a bluish light and ultraviolet radiation, which phosphor converts to visible wave lengths. The light can be made to approximate daylight.



A 40-watt fluorescent lamp gives as much light as a 150-watt ordinary incandescent bulb and is cooler in operation. Although a fluorescent lamp requires less electricity than an incandescent lamp to give off the same amount of light, it requires more electricity to turn on than an incandescent lamp. Therefore, fluorescent lamps are most efficient when they are used in situations where they are left on for long periods of time.

What is a compact fluorescent light bulb? A compact fluorescent light bulb is a miniature bulb, folded into a compact shape. The lights are called “compact” because they are much shorter than a conventional two foot or four foot fluorescent tube lamp. These bulbs can be used in standard bulb fixtures.



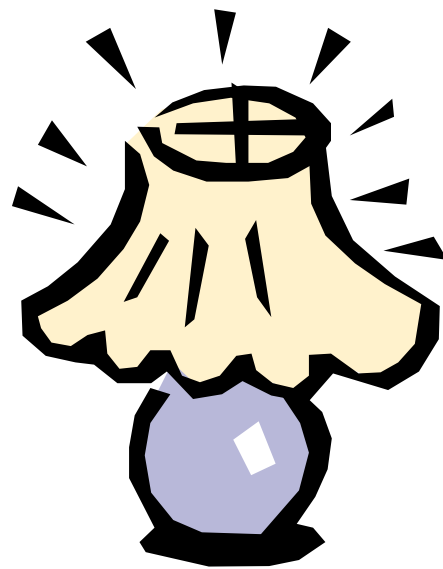
Compact fluorescent light bulbs are expensive to buy in the store, but save money later as these bulbs use one-quarter as much electricity and last about 10 times longer than ordinary light bulbs. An 18-watt compact fluorescent light bulb produces about the same amount of light as a regular 75-watt bulb. These energy saving bulbs can be used in any light fixtures, but may not fit all lamps because of their size. The bulbs have a life of 7,500 to 12,000 hours. This compares to a typical bulb life of 750 to 1,000 hours. Ten thousand hours is equal to about five

years of burning the light bulb five hours per day. This translates to a five-year energy savings of about \$50.

Good applications for the bulbs include lamps used for general lighting in the family room, work areas, porch or post lamps (outdoor models) and security lights.

How does it work and why does it save money?

The ordinary incandescent bulb most commonly used in homes is very inefficient because only one-tenth of the energy is consumed by an incandescent bulb is given off as light. The rest is given off as heat. This is because the incandescent bulbs use electricity to heat a coiled tungsten filament in an inert gas-filled bulb until the filament glows. The gas-filled, halogen bulbs are only slightly more efficient than the ordinary incandescent bulbs. Life long incandescent bulbs last longer than regular bulbs because the filament is operated at a lower temperature to extend its life, but unfortunately, they are even less efficient than regular bulbs. Energy efficient incandescent bulbs marketed under names such as “Watt Miser,” “Supersaver” or “Econo-Watt” bulbs, use 5-13 % less energy than standard bulbs.



How do compact fluorescent bulbs work? Fluorescent bulbs convert electric energy to visible light by using an electric charge to “excite” or provide energy to gaseous atoms. These atoms emit ultraviolet radiation, which is absorbed by phosphorus on the tube walls. The phosphorus coating produces the visible light. They are cool because little energy is wasted producing heat.

What about the “E-Lamp” bulb? The “E-Lamp” or electronic lamp uses a technology combining gas and electronics to produce light. A magnetic coil generates a high-frequency radio signal that ionizes mercury gas so it emits invisible light. A phosphor coating lines the inside of the bulb. Invisible light reflects on the phosphor coating, creating the glow. The bulb’s life span is 15,000 to 20,000 hours to 10 to 14 years (at four hours a day). It uses 25 watts to produce the same light as a 100-watt incandescent bulb.

Light Bulb Compare & Contrast Graphic Organizer

Compact Fluorescent



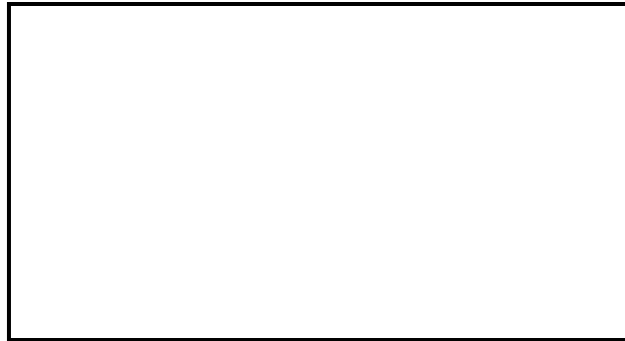
Incandescent



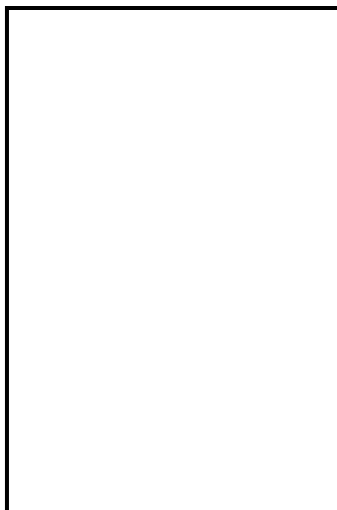
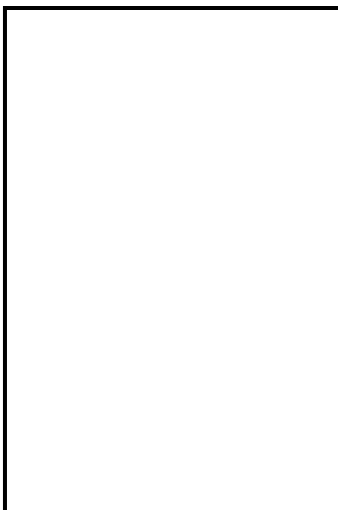
Similarities

Light Bulb Compare & Contrast Writing to Persuade

Position or Opinion



Reasons



Conclusion



A Personal Statement ↔ **A Prediction** ↔ **A Summary**

Energy Conservation

5.3 Analyzing an Electric Bill

You are sitting on the steps of your townhouse development talking with two friends. The parents of your friends come by and start talking and comparing their most recent electric bills. Since you have become a recent expert on energy saving ideas, they asked you why their bills are different.

ELECTRIC COMPANY		SEND PAYMENT TO P.O. BOX 551 BALTIMORE, MD 21203	
PLEASE RETURN THIS SLIP WITH YOUR PAYMENT			
CAR-RT SORT MR. SMITH 256 D ROAD BALTIMORE, MD 21567			
11254467558933210000		1235699	002348
ACCOUNT NUMBER	AFTER	AMOUNT WITH LATE CHARGE	AMOUNT DUE NOW
C4 JKIF3 43 0003	JAN 31 1996	83.00	81.50
Payments received - Thank you		81.50	
outstanding balance		0.00	
Charges due this period:		81.50	
Amount due now:		81.50	
AVERAGE TEMP FOR THIS PERIOD 1996 37 1995 39		UNITS 36 24 12 0 	
ELECTRIC RESIDENTIAL DEC 2 TO JAN 4		81.50	
ACCOUNT NUMBER: C4 JKIF3 43 0003 LATE PAYMENT CHARGE: 1.50 WILL BE ADDED AFTER: JAN 31, 1996 AMOUNT DUE NOW: 81.50			

Mr. Smith's Electric Bill

ELECTRIC COMPANY		SEND PAYMENT TO P.O. BOX 551 BALTIMORE, MD 21203	
PLEASE RETURN THIS SLIP WITH YOUR PAYMENT			
CAR-RT SORT MRS. JONES 123 STREET BALTIMORE, MD 21234			
11254467558933210000		1235699	002348
ACCOUNT NUMBER	AFTER	AMOUNT WITH LATE CHARGE	AMOUNT DUE NOW
A2 ALOR9 06 0000	JAN 31 1996	102.00	100.00
Payments received - Thank you		100.00	
outstanding balance		0.00	
Charges due this period:		100.00	
Amount due now:		100.00	
AVERAGE TEMP FOR THIS PERIOD 1996 37 1995 39		UNITS 36 24 12 0 	
ELECTRIC RESIDENTIAL DEC 2 TO JAN 4		100.00	
ACCOUNT NUMBER: A2 ALOR9 06 0000 LATE PAYMENT CHARGE: 2.00 WILL BE ADDED AFTER: JAN 31, 1996 AMOUNT DUE NOW: 100.00			

Mrs. Jone's Electric Bill

Energy Conservation

5.4 Conserving Energy at Your School

Part A – Energy in Schools

Schools use a tremendous amount of electricity. This is particularly true for those schools that are electrically heated and cooled. Just think of the large area that must be heated or cooled. Lighting is another major user. When all the electric appliances and equipment necessary for day-to-day operations of a modern school are considered, it is easy to understand the increasing dependence of schools on electricity, even though electricity is a major budget item. Some schools have monthly electrical bills of thousands of dollars.

Some newer school buildings are energy-efficient, but many older schools are not energy-efficient. Energy-saving buildings not only use less energy than wasteful buildings, but they are more comfortable.

Some key considerations in efforts to conserve energy at school are thermostat placement and setting, control of lighting, air vent location and the number and operation of windows and exterior doors. Thermostats should be located on interior (rather than exterior) walls. They should be set at 68 degrees during the winter and 78 degrees during the summer. Unused lighting should be turned off. Furniture arrangement should not block the flow of heated or cooled air from vents. Excessive windows and exterior doors are energy wasters, as are those that are too-often opened (while the building is being heated or cooled) or those that are left open. Of course, all unused electrical equipment and appliances should be turned off, but these are minor contributors to school energy bills when compared to heating, cooling and lighting.

Procedure:

1. Observe the classroom floor plans using “Classroom Diagram.”
2. Using the Classroom Compare and Contrast graphic organizer, identify and record the differences between classrooms 1 and 2.

3. Discuss the following questions:

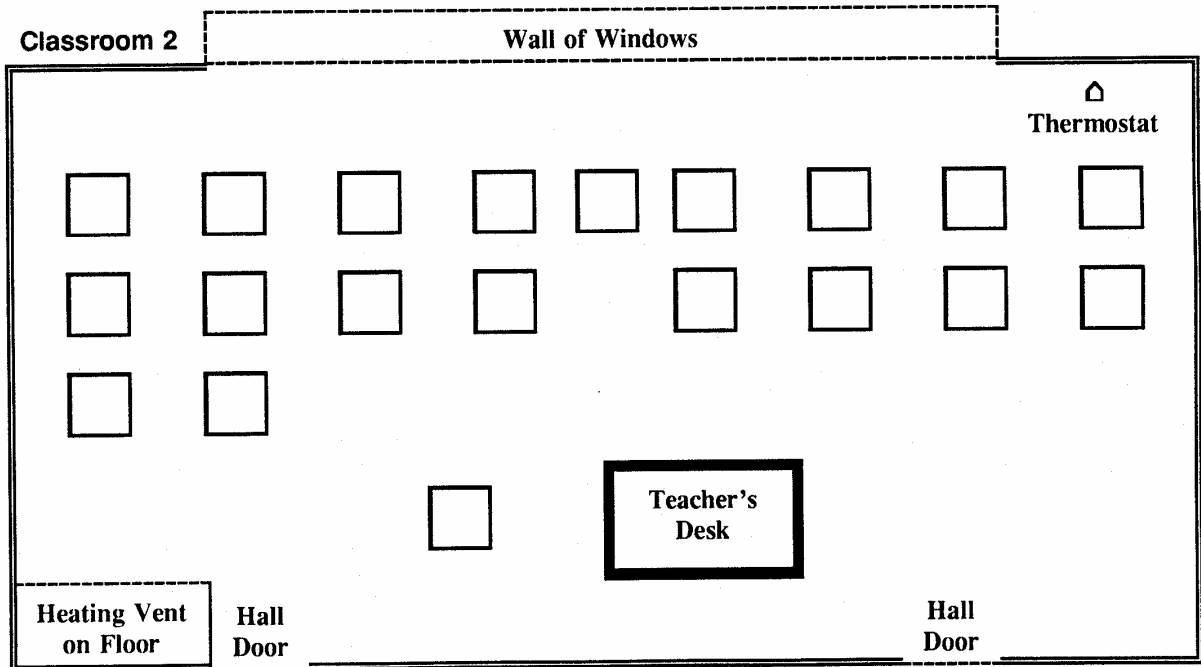
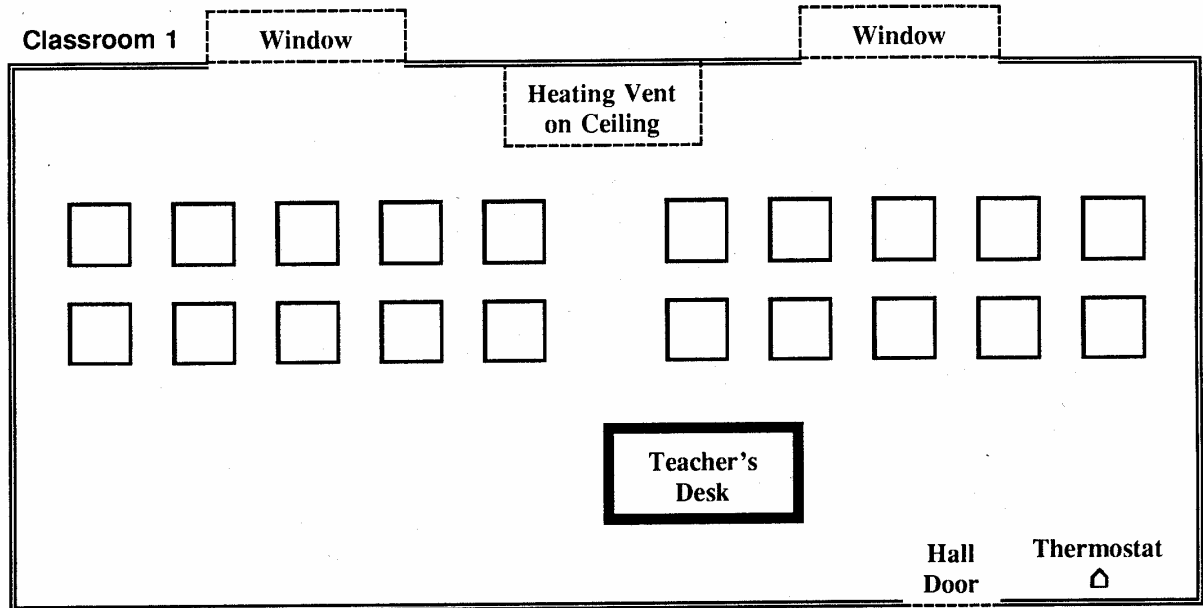
- a. Which classroom do you think is conserving energy?
- b. Which classroom is wasting energy? In what ways?
- c. What can be done to make this classroom more energy efficient?
- d. What other ways can you conserve energy in your classroom?
- e. Why is it important to conserve energy at school?

Adapted from The Energy Sourcebook, Tennessee Valley Authority



Conserving Energy at Your School

Classroom Diagram: Compare and Contrast



 = Student Desks

Conserving Energy at Your School

Classroom Compare and Contrast

Part B – Energy in Your School: Conserving or Wasting?

Use the “Energy in Your School: Conserving or Wasting?” sheet to observe energy being wasted or conserved in your school. Work in small groups to conduct the survey.

Discussion:

1. Discuss what observations you made in various classrooms or school areas.
2. Do you think your school is conserving energy?
3. Can your school conserve more energy? How?
4. Design and draw pictures of your classroom or the school building showing ways energy would be conserved.



Conserving Energy at Your School

Classroom Compare and Contrast Graphic Organizer

	⇐ Thermostat Placement ⇒	
	⇐ Number of Doors ⇒	
	⇐ Number of Windows ⇒	
	⇐ Vent/Furniture Arrangement ⇒	
	⇐ Thermostat Setting ⇒	

Energy in Your School: Conserving or Wasting?

Divide into small groups and visit various rooms in your school building (with permission). Try to observe the eight things listed below to help you discover whether energy is being wasted or conserved. If energy is being wasted, record a “1” in the waste column. If energy is being conserved, record a “1” in the conserved column. Add up the points.

Room: _____

Observation	Energy Fact	Conserved	Wasted
Thermostat	Should be located on inside walls and set at 68° in winter or 78° in summer.		
Floor Coverings	Carpeting helps keep the rooms more comfortable.		
Ceiling Height	About eight feet is average. Very high ceilings waste energy.		
Windows	Check for drafts and for numbers of windows.		
Classroom Air Vent Filters	Clean filters conserve energy. Dirty filters waste energy.		
Lighting	Unnecessary lights should be turned off.		
Exterior Doorways	Doors should be kept closed when heating or air conditioning is on.		
Furniture Placement	Furniture should not block heating or cooling vents		
TOTAL Points			
Overall Rating			

Energy Conservation

5.5 Developing a Personal Action Plan

I promise to be an Energy Saver.

Name: _____

Date: _____

Things I will do to save energy:

Using Energy	Saving Energy (1 Week)	Yes or No	Easy or Hard	Can I keep doing this?
Example: Leaving lights on when I'm not in the room.	Turn off lights when not in the room.			